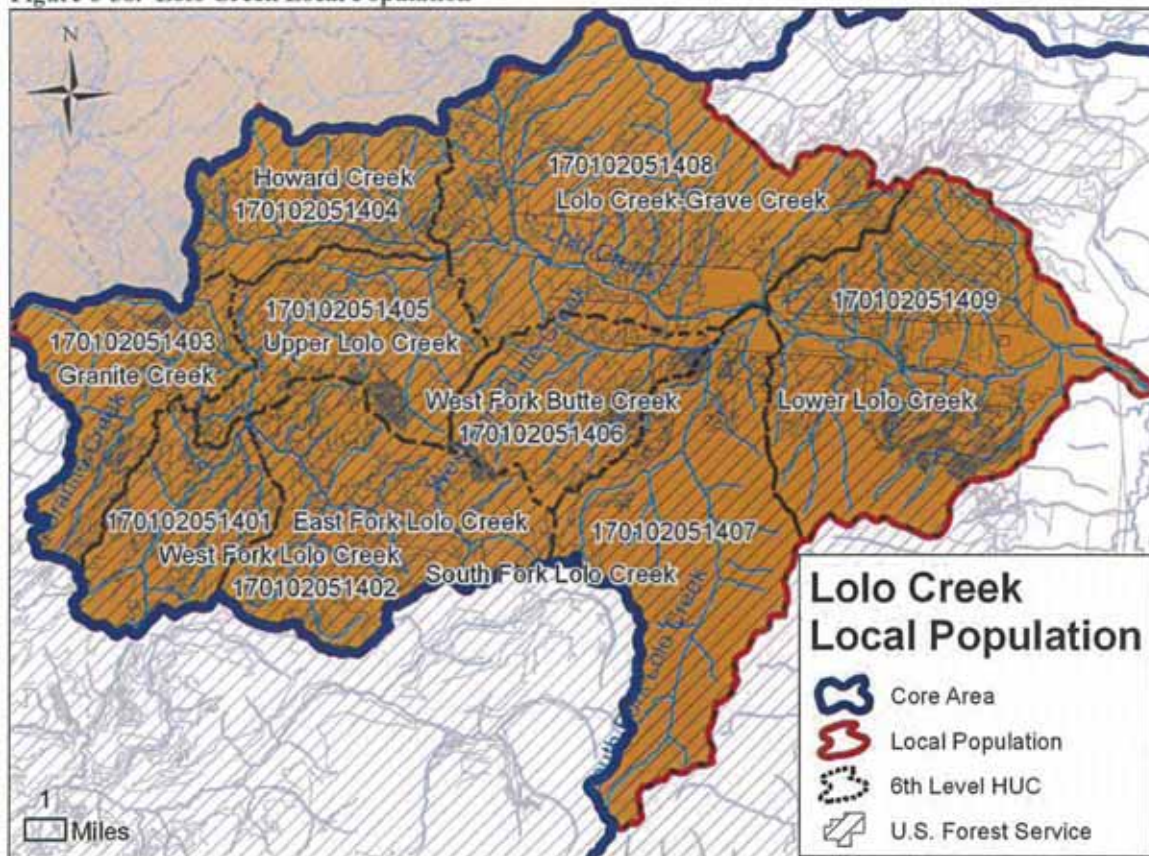


## **Attachment B**

**Local Population: Lolo Creek****Figure 6-38. Lolo Creek Local Population**

Relative Importance of Population to Core Area (H,M,L): M

**Table 6-14. Lolo Creek Local Population Summary**

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
0-50 Migratory 250-500 Res	Stable	Resident, Connected	0 (migratory)	High. Lolo Creek and most tributaries contain brook trout, although the South Fork (one of the known tributaries containing bull trout) is relatively free of non-natives in the upper half.
Significance of geographical location		Vulnerability to Climate Change		Unique Population Attributes
High – Lolo Creek is the only large watershed in the lower half of the Bitterroot River. For long-term recovery of bull trout, this watershed seems to be necessary.		Low. This is a large, high elevation watershed in a high precipitation zone, with some of the colder water temperatures on the forest (in tributaries, not the mainstem).		High. The middle and upper South Fork Lolo Creek are unique in that they contain a large patch of relatively pristine habitat with no non-native fish species and high bull trout densities.

**Temperature:** Temperatures are elevated due to the highway and logging roads. There are opportunities to improve temperature patterns by removing logging roads and improving riparian vegetation and function. There is little opportunity to reduce the effect of Highway 12 on temperatures. However, working with the State DOT to reduce brushing may have some benefit.

**Barriers:** The only known barrier on streams capable of supporting bull trout is Snowshoe Falls, which is a natural waterfall. There are likely smaller barriers that affect the transport of sediment and large woody debris, but these don't directly affect bull trout connectivity or movement patterns. There is a large diversion on the mainstem of Lolo Creek downstream of the South Fork (MacLay diversion) but fish passage at this site was addressed by MTFWP and TU in 2012.

**Pools:** The baseline indicator call for pools is FAR. This call is probably accurate for the Lee Creek portion of the HUC. However, the West Fork of Lolo Creek has few pools due to the presence of the highway, and would be rated FUR. There are opportunities to add large woody debris and create large debris jams in many places in Lee Creek.

**Sediment:** There are numerous opportunities to improve the sediment baseline. A large-scale roads analysis is necessary to identify the relative impacts and benefits of road removal for each road. While sediment levels are elevated in the HUC, the main direct source is the sanding of Highway 12. Cooperative discussions should be initiated to develop alternative practices to reduce sediment from this source.

**Most important activities to improve bull trout population:**

1. Add large woody debris complexes Lee Creek to create large, complex pool habitat.
2. Identify road related sediment issues and implement actions to eliminate these.
3. Coordinating with FWP to consider management that reduces numbers and distribution of non-native trout if it would benefit bull trout recovery in the Core Area.

**Individual HUC6 (w/in Local Pop) attributes and strategies, based on above factors**

<b>HUC6 (name and #): East Fork Lolo Creek - 170102051402</b>							
<b>Strategy (Active Restoration, Passive Restoration, Conserve): Active Restoration</b>							
<b>% Forest Service Ownership in HUC: 100%</b>							
<b>Relative Contribution of Habitat in Limiting Local Population: High</b>							
<b>Functional Significance to Local Pop: High</b>							
<b>Indicator</b>	<b>Current Baseline Condition</b>	<b>Proposed Baseline Condition</b>	<b>Timeframe to change baseline</b>	<b>Recovery Priority (1,2,3)</b>	<b>Estimated Cost to Complete</b>	<b>Expectation of population response (H,M,L)</b>	<b>Timeliness of opps (H,M,L)</b>
Temperature	FUR	FAR	10 years	3	\$100,000	H	M
Barriers	FAR	FA	10 years	3	\$100,000	M	M
Pools	FAR	FA	10 years	3	\$100,000	H	H
Sediment	FUR	FAR	10 years	3	\$200,000	H	M

This HUC contains the East Fork of Lolo Creek and Lost Park Creek. Lost Park Creek is a tributary to the East Fork, and supported a resident population of bull trout up until the last several years. This HUC is critical in the long-term recovery of bull trout in Lolo Creek because it contains miles of suitable spawning habitat and the stream systems are relatively large. They also maintain cold water

due to the high elevation, high precipitation zone that the HUC lies in. There are extensive road networks throughout the HUC. Many of these roads have been cost-share roads with Plum Creek, and therefore opportunities to remove them have been limited in the past. However, with the Montana Legacy Project, the Lolo National Forest now owns the roads, and there is an unprecedented opportunity to remove roads and restore both aquatic and terrestrial habitats at a large scale. In addition, there are currently high densities of brook trout in the HUC, and discussions with FWP regarding brook trout suppression seem timely.

**Temperature:** Temperatures the East Fork are low; however, they are likely elevated above natural due to roads, past grazing, and impacts from riparian harvest. There are opportunities to improve temperature patterns by removing roads and improving riparian vegetation and function. In addition, adding large woody debris to the East Fork and Lost Park Creek would indirectly improve temperature patterns while directly improving pools.

**Barriers:** Known barriers on LNF administered bull trout streams have been removed over the last several years. However, it is very likely that there are barriers on old Plum Creek roads, and an intensive assessment of these, along with recommendations for removal, is necessary as a first step. Following this, removal of any critical barriers would be important in the short-term.

**Pools:** The baseline indicator call for pools is FAR. While there is some pool habitat available in low gradient reaches of these streams, there is an overall lack of large, debris created pools that bull trout rely on. With the change in ownership, and the remoteness of the HUC relative to main road systems, there is a prime opportunity to develop large debris jams on both the East Fork and Lost Park Creek. In addition, there are opportunities to add large wood to the channel to allow the natural process of pool formation to occur. This is a high priority project in the HUC.

**Sediment:** There are numerous opportunities to improve the sediment baseline. A large-scale roads analysis is necessary to identify the relative impacts and benefits of road removal for each road. It is likely that there will be significant opportunity to reduce sediment by significantly reducing road densities in the HUC.

**Most important activities to improve bull trout population:**

1. Add large woody debris complexes and large individual pieces to the East Fork and Lost Park Creek to create large, complex pool habitat.
2. Determine whether barriers exist on previously owned and managed Plum Creek roads and take actions to address these.
3. Undertake a large-scale roads analysis to determine the minimum road system necessary and maintainable given likely LNF road maintenance budgets. Take actions to eliminate roads that are resulting in added sediment to streams.
4. Coordinating with FWP to consider management that reduces numbers and distribution of non-native trout if it would benefit bull trout recovery in the Core Area.

## 6.0 Allocations and TMDLs

## 6.2 East Fork, Granite Creek, Lee Creek, and Lost Park Creek Road Allocations and TMDL

The reduction in human loading for all five streams in Upper Lolo TPA is shown in Table 15. These reductions were derived using the same approach discussed in Section 6.1. As this is a non-point source TMDL, no waste load allocation is necessary. The load allocation for the East Fork, Granite Creek, Lee Creek and Lost Park Creek are based on modeled sediment delivery given planned road BMP improvements and road closures on Lolo National Forest and Plum Creek lands. These load allocations also include estimates of natural background sediment loading as discussed in Section 4.7. As discussed above in Section 6.1, the allocations in the West Fork Lolo Creek were divided between U.S. Highway 12 and forest roads.

**Table 15.** Load allocations, percent reductions and TMDLs for the Upper Lolo TPA (all values are in tons/year).

<b>Granite Creek</b>	
Natural Load	449
Existing Forest Roads Load	96
Total Load	545
Reduction from Forest Roads	50 (52%)
TMDL	495
<b>Lee Creek</b>	
Natural Load	95
Existing Forest Roads Load	9
Total Load	104
Reduction from Forest Roads	5 (56%)
TMDL	99
<b>Lost Park Creek</b>	
Natural Load	192
Existing Forest Roads Load	21
Total Load	213
Reduction from Forest Roads	9 (43%)
TMDL	204
<b>East Fork Lolo Creek</b>	
Natural Load	596
Existing Forest Roads Load	53
Total Load	649
Reduction from Forest Roads	19 (36%)
TMDL	630
<b>West Fork Lolo Creek</b>	
Natural Load	246
Existing Forest Roads Load	19
Existing Highway 12 Load	425-518
Total Load	690-783
Reduction from Forest Roads	6 (33%)
Reduction from Highway 12	140-171 (33%)
TMDL	543-605

### Total Maximum Daily Load Allocations

Achievement of the targets will reduce the annual TMDLs of human-caused fine sediments in these streams by 33 to 64 percent. Through implementation and mitigation efforts outlined in this WQRP, the annual human-caused forest road/Highway 12 sediment input into West Fork Lolo Creek would be reduced by 33 percent from 690-793 tons to 531 - 593 tons. Concurrently, the annual anthropogenic load from forest roads will be reduced in the East Fork Lolo Creek by 36 percent from 53 tons to 34 tons, in Granite Creek by 52 percent from 96 tons to 46 tons, in Lee Creek by 56 percent from 9 tons to 4 tons, and by 43 percent in Lost Park Creek from 21 tons to 12 tons (see Table E -3).

**Table E - 3.** Upper Lolo Waterbodies' TMDL Load Allocations.

<b>TMDL Allocations</b> <i>in tons per year unless otherwise indicated</i>						
<b>Stream</b>	<b>Road Loads</b>		<b>TMDL</b> (tons/year)	<b>Current Loads from Roads</b> (tons/year)	<b>Current Natural Sediment</b> (tons/year)	<b>Total Current Sediment</b> (tons/year)
	<b>After TMDL Reduction</b> (tons/year)	<b>Percentage Reduction in Road Sediment &amp; Traction Sand</b> %				
West Fork Lolo Creek	12 (Forest roads)	33%	<b>543-605</b>	19 (Forest roads)	246	690-783
	285-347 (Hwy. 12)	33%		425-518 (Hwy. 12)		
East Fork Lolo Creek	34	36%	<b>630</b>	53	596	649
Granite Creek	46	52%	<b>471</b>	96	449	545
Lee Creek	4	56%	<b>97</b>	9	95	104
Lost Park Creek	12	43%	<b>199</b>	21	192	213

### Improvement Strategy and Monitoring

The implementation methods include:

- upgrade remaining forest roads to meet Montana Forestry BMPs;
- reclaim forest roads that are surplus to the needs of forest land managers;
- improve inspection and maintenance of existing culverts;
- implement Montana's Forestry BMPs on all timber harvest operations;
- upgrade undersized culverts over time to better accommodate large floods;
- further reduce sediment delivery from U.S. Highway 12, through improved use and maintenance of sediment traps, plowing techniques, and guardrail cleaning; and
- correct those priority fish passage barriers that are significantly affecting the connectivity of native fish habitats.

## 1.0 BACKGROUND

The following impaired waterbodies are included within the boundaries of the Upper Lolo TMDL Planning Area (TPA) (**Appendix B**):

- East Fork Lolo Creek
- Granite Creek
- Lee Creek
- Lost Park Creek
- West Fork Lolo Creek

Pollutants of concern include the following (**Appendix C**):

- Sediment

Within the Upper Lolo TPA, the most significant pollutant sources include (**Appendix E**):

- Forest roads
- US Highway 12

At the time that the TMDL was written, there were only two major landowners in Upper Lolo TPA: the U.S. Forest Service (Lolo National Forest) and Plum Creek Timber Company. Between 2008 and 2010, ownership of nearly all the Plum Creek land in the Upper Lolo TPA was transferred to the Lolo National Forest through a major land purchase and transfer known as The Montana Legacy Project. The transfer was facilitated by The Nature Conservancy and The Trust for Public Land (The Montana Legacy Project, 2010).

In 2005, the Lolo National Forest signed a Decision Notice, allowing the Forest to implement an Environmental Assessment (EA) with the commitment to remove or replace 22 culverts, decommission 58 miles of roads, and do BMP upgrades on 35 miles of major roads (Greenup and Mickelson, 2010). Most of the watershed restoration that has been completed thus far was completed following the EA for Upper Lolo Watershed Restoration.

The Lolo Watershed Group (LWG) is the main non-governmental organization (NGO) dedicated to watershed restoration in the Upper Lolo TPA. The LWG currently has a Section 319 grant to develop a Watershed Restoration Plan (WRP). The WRP will outline sources of impairment, management actions, estimated load reductions, estimated technical and financial assistance that will be needed for restoration and provide an estimated time frame to complete specific projects. It is expected that this plan will be completed by June 30, 2011 (Sturgis, Wendy, personal communication 11/1/2010).

## 2.0 TMDL-RECOMMENDED ACTIVITIES

The TMDL document recommends specific restoration activities for addressing sediment within the Upper Lolo TPA. These recommendations were made based on the TMDL load allocations for forest roads and US Highway 12 (**Appendix C**). In addition, the TMDL document made recommendations for fish passage. These recommendations are as follows:

- • Upgrade remaining forest roads to meet Montana Forestry BMPs,
- • Reclaim forest roads that are surplus to the needs of forest land managers,
  - Improve inspection and maintenance of existing culverts,
  - Implement Montana's Forestry BMPs on all timber harvest operations,
- • Upgrade undersized culverts over time to better accommodate large floods,
  - Further reduce sediment delivery from US Highway 12 through improved use and maintenance of sediment traps, plowing techniques, and guardrail cleaning, and,
- • Correct priority fish passage barriers that are significantly affecting the connectivity of native fish habitats.

The TMDL's water quality-monitoring plan has the following objectives:

1. Document water quality trends associated with proposed implementation efforts.
2. Establish additional permanent monitoring sites and collect additional data within the TPA to help better define water quality targets.
3. Monitor progress towards meeting water quality targets.
4. Conduct an adaptive management strategy to fulfill requirements of [the TMDL].

To help achieve these objectives the TMDL document recommends the following types of monitoring activities:

- • Establish permanent bench-marked cross-sections where channel pattern, dimension and profile can be tracked through time using Rosgen Level II parameters (width/depth ratios, entrenchment ratios and sinuosity) and techniques,
  - Collect additional parameters (pool frequency, pool residual depth),
- • Particle size distribution data should be collected using Wolman pebble count procedures through riffles at the established cross-sections,
  - Conduct a road sediment assessment using the Forest Road Survey (FRS) for select watersheds in which recent forest management activities have taken place,
- • Monitor for fish redds and fine sediment, and associated documentation of the results, on a yearly basis,
  - Monitor population status of native salmonid species and report finding to DEQ,
  - Update an assessment of channel conditions and other geomorphic indicators for the whole length of the Lolo Creek Watershed to help determine existing conditions and help track potential future impacts to this important waterbody and to tie in with future downstream TMDL development,
  - Track the effectiveness of BMPs on forest roads and US Highways 12 and other mitigation measures at meeting targets. This could be done by comparing existing instream data to data following upgraded practices and mitigation measures,
  - Develop a database using the Forest Service's significant amount of stream data on potential reference reaches with the TPA to help guide future target setting and evaluation for waterbodies in Lolo Creek and elsewhere in the Bitterroot Basin, and,

## 3.0 INDICATORS OF PROGRESS

Indicators of progress towards achieving Upper Lolo TMDL targets generally fall into one of three major categories: 1) Restoration, 2) Monitoring, and 3) Planning.

### 3.1 RESTORATION

The extent of completed restoration work and how it compares to the TMDL load allocations represents a significant indicator of progress towards meeting TMDL targets.

In 2006, Plum Creek demonstrated a 9% reduction in road sediment delivery to Granite Creek between 1998 and 2005 (Sugden, 2010). Reductions between 2005 and 2009, when Plum Creek sold its lands to The Nature Conservancy, were not accounted for in this evaluation. Plum Creek Timber Company completed the sale of lands in the Upper Lolo TPA to The Nature Conservancy by February 2009. At that time Plum Creek had upgraded 95% of the roads in the Granite Creek, East Fork Lolo Creek and West Fork Lolo Creek drainages to meet state BMP standards and decommissioned 0.4 miles of forest roads. Plum Creek also corrected numerous fish passage barriers in cooperation with the Lolo Nation Forest as a cost-share partner (Sugden, 2010).

The Lolo National Forest has done a significant amount of restoration in the Upper Lolo TPA. This restoration work was completed based on the commitment outlined in the 2005 Decision Notice from the Lolo National Forest. Work completed through the spring of 2010 includes the removal of 37 culverts, and decommissioning 64.89 miles of forest roads within the TPA, which exceeds the 2005 commitment for road decommissioning and culvert removal. Work yet to be completed includes BMP upgrades to an additional 35 miles of major roads and improving an additional 11 culverts (Greenup and Mickelson, 2010). The decommissioning of roads should bring forest roads closer to the designated TMDL load allocations for sediment. The removal or replacement of culverts should improve fish passage, and as of 2010, has made over 10 miles of upstream habitat accessible (Greenup and Mickelson, 2010).

The Montana Department of Transportation (MDT) has also taken action to implement the TMDLs for the West Fork Lolo Creek, by decreased application of road sand and increased sand recovery from US Highway 12 during the winter maintenance season. During the 2002-2003 winter maintenance season, MDT estimated that 1,238 tons of road sand were applied to US Highway 12 in the Upper Lolo TPA. This was compared to an estimated 3,300 tons in the 1999-2000 season (Montana Department of Transportation, 2004). In 2008, 778 tons of road sand were applied, while 480 tons were recovered, resulting in 298 net tons of road sand applied to US Highway 12 during the 2008 winter maintenance season (Montana Department of Transportation, 2009). MDT also began using ditch blocks of river cobble and coarse gravel to slow runoff and allow suspended solids to settle out (Montana Department of Transportation, 2004) (Appendix D).

An environmental assessment (EA) was completed in April 2010 for the Kearsarge Module Transport Project which would require modifications to US Highway 12, by Imperial Oil, in the Upper Lolo TPA to accommodate oversized loads (Tetra Tech, 2010). At the time of this evaluation, MDT is not anticipating using additional traction sand on US Highway 12 during the winter maintenance season due to oversized loads. In addition, Imperial Oil's contractor would be required to utilize appropriate BMPs during

## 4.0 RECOMMENDATIONS FOR ADDITIONAL WORK

Suggestions for additional restoration work are outlined below:

- • Continue to implement recommendations as outlined in the TMDL and summarized in Section 2 of this evaluation; specifically, reclaiming surplus forest roads, and implementing BMPs on forest roads and timber harvest operations. After BMP implementation, consider an assessment that estimates reductions of road sediment.
- • Continue implementation of the Forest Service's 2005 Decision Notice; specifically, culvert replacement and forest road BMPs.
- • Increase monitoring activities as outlined in the TMDL document and summarized in Section 2 of this evaluation, and report findings to DEQ.
  - Complete the watershed restoration plan for the Lolo Watershed.
  - Continue implementation of BMPs from the TMDL for US Highway 12 and report findings to DEQ.
  - Continue to document winter maintenance activities on US Highway 12 by MDT. Submit annual reports to DEQ summarizing these activities and specifically address any changes in management and how those compare to the maintenance activities, BMPs and loads set forth in the TMDL document.

## Upper Lolo Sediment TMDL Implementation Evaluation – Appendix C

**APPENDIX C – TMDL TABLES****Table C-1: (TMDL Table E-1) Waterbodies and Pollution Sources\***

Segment Name	Waterbody Number	Length (mi)	Probable Causes	Probable Sources
West Fork Lolo Creek	MT76H005_05	6.8	Other habitat alterations, Siltation	Silviculture- habitat modification-other than bank or shoreline modification hydromodification/destabilization; Highway maintenance and runoff
East Fork Lolo Creek	MT76H005_04	7.4	Other habitat alterations, Siltation	Silviculture-logging road construction/maintenance
Granite Creek	MT76H005_03	8.5	Other habitat alterations, Siltation	Silviculture-logging road construction/maintenance
Lee Creek	MT76H005_07	3.8	Other habitat alterations, Siltation	Silviculture- logging road construction/maintenance; Habitat modification-other than bank or shoreline hydromodification/destabilization
Lost Park Creek	MT76H005_06	5	Other habitat alterations, Siltation	Silviculture- logging road construction/maintenance

\*TMDL Table E-1 can be found on page v of the final TMDL document.

**Table C-2: (TMDL Table 12) In-stream Targets for the Upper Lolo TPA\***

Life Stage & Channel Stability	Parameter	Targets	
		Stream Type**	
Embryo Development	Percent fines < 2 mm	A	22%
		B	16%
		C	21%
Emergence	Percent fines < 6 mm	A	31%
		B	21%
		C	30%

\*TMDL Table 12 can be found on page 36 of the final TMDL document.

\*\* Based on Rosgen stream type classification (Rosgen, 1996).

**Table C-3: (TMDL Table 13) Performance-Based In-Stream Targets for the Upper Lolo TPA\***

Life Stage & Channel Stability	Parameter	Targets
Rearing	Pool Frequency	Established following both reference and response reach data collection*
Channel Structure/Stability	V**	
Channel Structure/Stability	Entrenchment Ratio	
	Width/Depth Ratio	
	Sinuosity	

\*TMDL Table 13 can be found on page 37 of the final TMDL document.

\*\* Explanation of data collection is outlined in Section 8-of the TMDL document

## Upper Lolo Sediment TMDL Implementation Evaluation – Appendix C

Table C-4: (TMDL Table 15) Load Allocations and Percent Reductions\*

Pollutant: Sediment Waterbody	Source	Existing Load (tons per year)	Allocation (tons per year)	Load Reduction
West Fork Lolo Creek	Forest Roads, Highway 12	690-783	543-605	33%
East Fork Lolo Creek	Forest Roads	649	630	36%
Granite Creek	Forest Roads	545	471	52%
Lee Creek	Forest Roads	104	97	65%
Lost Park Creek	Forest Roads	213	199	43%

\*TMDL Table 15 can be found on page 42 of the final TMDL document.

## Lolo Creek Watershed Restoration Plan

Restoration opportunities for the Lolo Creek watershed include:

- Restore water to the drainages by ensuring only valid water rights users are diverting water
- Place fish screens on ditches
- Remove fish passage barriers such as irrigation dams and inadequate culverts to help restore fish movement through the drainages
- Reclaim excess logging roads
- Maintain needed roads using BMPs to reduce sedimentation.
- Ameliorate damage from the history of intensive timber management by
  - Limiting logging in heavily logged areas
  - Restricting logging in riparian zones
  - Recruiting large woody debris to increase habitat complexity in streams
- Educate landowners and developers on the risks of building too near waterways
- Encourage restoration native riparian vegetation along streambanks
- Help landowners facing streambank erosion to develop stabilization plans that do not transfer the stream's energy downstream (such as using soft stabilization techniques rather than riprap)
- Manage irrigation water more efficiently
- Encourage water rights holders who are not using the water to return water rights to instream flow through cooperation with the Clark Fork Coalition
- Restore meanders to Lolo Creek to decrease the effects of channelization on downstream property owners. (This would involve creating bridges or culverts on Highway 12,)

## Restoration opportunities and recommendations

**Table 4.2. Restoration opportunities (Zelazny, 2004, 2006) by subbasin/tributary/mainstem section.**

<i>Bitterroot Subbasin</i>	<i>Creeks of Lolo Creek</i>	<i>Restoration Opportunities</i>
West Fork of Lolo Creek 1401	West Fork of Lolo Creek	1, 5, 6
	Lee Creek Separate in TMDL document only	5, 2
East Fork of Lolo Creek 1402	East Fork of Lolo Creek	2, 5, 6, 11
	Lost Park Creek	1, 2, 5, 6, 11
Granite Creek 1403	Granite Creek	1, 2, 5, 6, 11
Howard Creek 1404	Howard Creek	1, 2, 5, 6, 11
Upper Lolo Creek 1405	Davis Creek	1, 2, 5, 6, 11
	Chief Joseph Gulch	1, 5, 6, 11

## Lolo Creek Watershed Restoration Plan

<i><b>Bitterroot Subbasin</b></i>	<i><b>Creeks of Lolo Creek</b></i>	<i><b>Restoration Opportunities</b></i>
	Cloudburst Creek	1, 5, 6, 11
	Martin Creek	
West Fork Butte Creek 1406	West Fork Butte Creek (within South Fork of Lolo Creek)	1, 2, 5, 6
South Fork of Lolo Creek 1407	South Fork of Lolo Creek (less West Fork Butte Cr.)	3, 5, 6, 10
Lolo Creek - Grave Creek 1408	Grave Creek and East Fork of Grave Creek	1, 5, 6, 11
	Clark Creek	1, 5, 6, 11
	Bear Creek	1, 2, 5
	Camp Creek	1, 3, 4-6, 11
	Woodman Creek	1-6, 11
Lower Lolo Creek 1409	Sleeman Gulch	little influence on watershed health
	Tevis Creek	1, 2, 3, 10
	Mill Creek	1, 3, 4, 9
	John Creek	3, 7, 8
	Mormon Creek	1-6
<p><b><u>Key to codes in table:</u></b>  <b>Restoration opportunities as noted in Zelazny (2004, 2006)</b>  1. Recruit large woody debris  2. Remove inadequate/damaged culverts  3. Maintain instream flows  4. Screen irrigation diversions  5. Reduce sedimentation through BMPs  6. Remove unneeded roads  7. Reconnect to Lolo Creek main stem  8. Repair damage to springs  9. Remove illegal diversions  10. Manage livestock grazing  11. Restrict silviculture to areas away from creek (Forest BMPs)</p>		

## Lolo Creek Watershed Restoration Plan

Table 6.1 The educational and outreach goals, objectives and proposed tasks.

GOAL:	OBJECTIVE:	TASKS / ACTIVITIES:	PROPOSED PARTNERS	POSSIBLE FUNDING SOURCES
1. Increase public awareness & knowledge of impacts of human activities on the watershed	a. Develop community and school-based educational programs, events and materials that focus on non-point source pollution, BMPs, human impacts on water quality, water quantity, stream health, weeds and wildlife	Determine priorities; define audiences; develop content & messages; decide delivery mechanisms/methods; develop evaluation & assessment plan; collaborate with partners to obtain funding & maximize resources. Examples: field trips, landowner tours, booths at local fairs, publications, newsletters, presentations at public meetings, monitoring programs.	LWG, DEQ, LNF, MslaCD, FWP, RI, CFC, WQD, WEN, BWF, Weed District	DEQ, DNRC, Msla CD WQD Private foundations
	b. Provide guidance, references, resources and technical assistance to landowners, educators, partners & local organizations to facilitate use of BMPs	Promote & publicize stakeholder agencies/partners and their available resources (permitting, funding and technical expertise) at local meetings, venues & events; provide information on permitting processes; continue to assist landowners with 310 permits, cost-share grant proposals, weed district grants, etc	LWG, DEQ, LNF, MslaCD, FWP, WQD, CFC, DNRC, Weed District	
2. Increase public participation in citizen-based stewardship and conservation activities	a. Develop community and school-based stewardship programs based on high-priority restoration projects that advance overall watershed goals	Develop volunteer recruitment, training, recognition & retention plan; utilize research & activities that foster stewardship; set targets & timeline for volunteer rates; collaborate with partners to publicize & promote activities. Examples: same as above	LWG, DEQ, LNF, FWP, RI, CFC, , Msla CD, WEN, Trout Conservancy, BWF, TU, UM Watershed Health Clinic,	DEQ, DNRC, Msla CD WQD Private foundations

## Lolo Creek Watershed Restoration Plan

## Chapter 10. Technical Monitoring and Analysis Plan

**EPA Element 9.** *A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established in the chapter above.*

### Upper and Lower Lolo Creek TMDL Planning Areas

To help achieve the TMDL objectives, DEQ\_PPA\_WQPB\_WPS 2010 recommends the following types of monitoring activities:

1. Establish permanent bench-marked cross-sections where channel pattern, dimension and profile can be tracked through time using Rosgen Level II parameters (width/depth ratios, entrenchment ratios and sinuosity) and techniques,
2. Collect additional parameters (pool frequency, pool residual depth),
3. Collect particle size distribution data using Wolman pebble count procedures through riffles at the established cross-sections,
4. Conduct a road sediment assessment using the Forest Road Survey (FRS) for select watersheds in which recent forest management activities have taken place,
5. Monitor for fish redds and fine sediment, and associated documentation of the results, on a yearly basis,
6. Monitor population status of native salmonid species and report findings to DEQ,
7. Update an assessment of channel conditions and other geomorphic indicators for the whole length of the Lolo Creek Watershed to help determine existing conditions and help track potential future impacts to this important waterbody and to tie in with future downstream TMDL development,
8. Track the effectiveness of BMPs on forest roads and US Highways 12 and other mitigation measures at meeting targets. This could be done by comparing existing instream data to data following upgraded practices and mitigation measures,
9. Develop a database using the Forest Service's significant amount of stream data on potential reference reaches with the TPA to help guide future target setting and evaluation for waterbodies in Lolo Creek and elsewhere in the Bitterroot Basin, and,
10. Use data and information to assist the current Clark Fork/Bitterroot model efforts that are being developed.

### Additional Monitoring for Lower Lolo Creek public and private ownerships

1. Continue stream flow and temperature monitoring partnership with the Clark Fork Coalition, adding one or two additional sites to collect data below the confluence with the South Fork of Lolo Creek and above the OZ Ranch water right. Monitor for flow and temperature changes as streamside vegetation and stabilization projects are completed.
2. Establish a USGS gauging station near the historical site of the Sleeman Creek station to continue the record of output flow from Lolo Creek. Observe flow rate changes through years to observe the effects of timberland revegetation, excess road removal, stabilization and revegetation projects.
3. Develop a database of ground water quality values from public ground water wells in the Lolo Creek watershed, both historical and ongoing to monitor changes in ground water quality.